

A new monotypic genus and new species of lady beetle (Coleoptera: Coccinellidae: Coccinellini) from western South America

NATALIA J. VANDENBERG

Systematic Entomology Laboratory, ARS-USDA c/o Smithsonian National Museum of Natural History, 10th and Constitution Avenue NW, Washington, DC, USA.

E-mail: VandenbergN@si.edu or Natalia.Vandenberg@ars.usda.gov

Abstract

A new monotypic genus *Argosadalia* gen. nov. and new species *A. priscilla* sp. nov. are described from the forests of Bolivia, Ecuador, and Peru. The new taxon is placed in the tribe Coccinellini in a group informally designated as the “*Neda*-group,” and comprising the genera *Neda* Mulsant; *Mononeda* Crotch; *Neoharmonia* Crotch and *Argosadalia*. Key morphological and anatomical characters of the new taxa are described and illustrated and the character states that define the *Neda*-group are reviewed.

Key words: cloud forest, rainforest, neotropical, *Neda*-group, *Neda*, *Mononeda*, *Neoharmonia*, *Adalia*

Introduction

I first encountered the new species described herein (Figs. 1–4) during a visiting curatorship to the Smithsonian National Museum of Natural History (USNM), Washington, DC in 1989. It was represented by a series from Bolivia collected in 1951 by G. H. Dieke and provided with the manuscript name *Adalia cardenasi* Dieke. Dieke is probably best known for his systematic studies of plant-feeding lady beetles (Epilachnini) (Dieke 1947). However, his personal collection of more than 24,000 specimens, acquired by the Smithsonian National Entomological Collection (Anonymous 1976), represents a much broader sampling of this diverse family.

Dieke assumed that the new species he discovered was a member of the genus *Adalia* Mulsant, 1850, which is known to occur in arctic and temperate areas of the Old and New World, including western and southern parts of the South American continent. Dieke’s generic placement was probably based on the form of the abdominal postcoxal line, which in *Adalia* (Fig. 8) is described as recurring toward the base of the segment. While this configuration of the postcoxal line is relatively rare within the New World Coccinellini (aside from some of the slender, long-legged genera – *Hippodamia* Dejean, 1837, *Macronaemia* Casey, 1899, and *Anistosticta* Chevrolat in Dejean, 1837), many members of the tribe have the first abdominal ventrite with an oblique dividing line (Fig. 10) in addition to the main postcoxal line. In some genera, such as *Neoharmonia* Crotch, 1871 (Fig. 9), the postcoxal line may be fused to the oblique line and may be partially obliterated laterally beyond the juncture point, thus describing a modified V shape. This condition is similar to what we see in the new species, although in the latter case the postcoxal line does not continue beyond the juncture with the oblique line (Fig. 7). Examination of the male and female genitalia of the new species confirmed my suspicions that Dieke’s specimens belong to a group of genera closely allied to *Neda* Mulsant, 1850, including *Neda*, *Mononeda* Crotch, 1874, *Neoharmonia* and a number of undescribed genera that share certain genitalic features (Vandenberg 1992; Vandenberg & Gordon 1996).

In the present work, the new species is assigned to a new monotypic genus and key characters are described and illustrated. In addition to Dieke’s manuscript types, more specimens of the new species were encountered amongst unidentified material in the Bishop Museum, plus a single exemplar from the Paris Museum, and a series borrowed from the Instituto-Fundacion Miguel Lillo in Argentina. Digital photographs posted on the internet (McClarlin 2015; González 2015) provide more recent documentation of this lady beetle. The current known distribution for the species includes localities in Bolivia, Peru, and Ecuador (Fig. 20), ranging from 360 m–960 m in elevation, and suggesting a preference for rainforest habitats.

Material and Methods

The following acronyms are used in the text to indicate specimen depositories and institutional affiliations:

KSBS	University of Kansas Natural History Museum, Lawrence, Kansas, USA
USNM	United States National Entomological Collection, U.S. National Museum of Natural History, Washington, D.C., USA
IFML	Instituto-Fundacion Miguel Lillo, Universidad Nacional de Tucumán, San Miguel de Tucumán, Argentina
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, USA
MNHN	Muséum National d'Histoire Naturelle, Paris, France

Genitalia dissections were performed with the aid of a stereomicroscope and standard dissecting tools (forceps, scalpel, needle). Whole specimens were soaked in warm water to soften and then the abdomen removed and the rest of the specimen re-dried and point-mounted. The abdomen was next transferred to a 10% solution of KOH to dissolve excess tissue and partially clear opaque areas. Genitalia were extracted through the base of the abdomen (male specimens) or by peeling back the tergites along one side (female specimens), leaving the abdominal ventrites intact. Temporary slide mounts were prepared in glycerin or KY Glycerin Lubricating Jelly. After examination, the genitalic structures were placed in a genitalia vial with a drop of glycerin and mounted beneath the body of the dried specimen. Digital illustrations were created in Adobe Photoshop CS2 based on camera lucida sketches made with a drawing tube attached to a Zeiss Discovery V8 stereo microscope or Zeiss compound microscope. Morphological and anatomical terminology used in the descriptions follows Vandenberg (2002) or Ślipiński (2007) with cross-referencing when appropriate. Measurements were made using an ocular micrometer attached to a dissecting microscope for dissected structures, or a hand held micrometer for whole body measurements.

Taxon sampling. In addition to the new species described herein, exemplars of allied Coccinellini genera in the Neda-group (*sens. Vandenberg 1992, Vandenberg & Gordon 1996, Vandenberg 2002*) were widely sampled. Key characters of each of these genera were illustrated based on their respective type species: *Neda norrisii* (Guérin-Méneville, 1844), *Mononeda marginata* (L., 1767), and *Neoharmonia venusta* (Melsheimer, 1847). The abdominal postcoxal line of two other more distantly related Coccinellini genera, *Adalia bipunctata* (L., 1758) and *Coccinella* sp. were examined and illustrated for comparative purposes.

Systematics

Order Coleoptera Linnaeus, 1758

Family Coccinellidae Latreille, 1807

Subfamily Coccinellinae Latreille, 1807

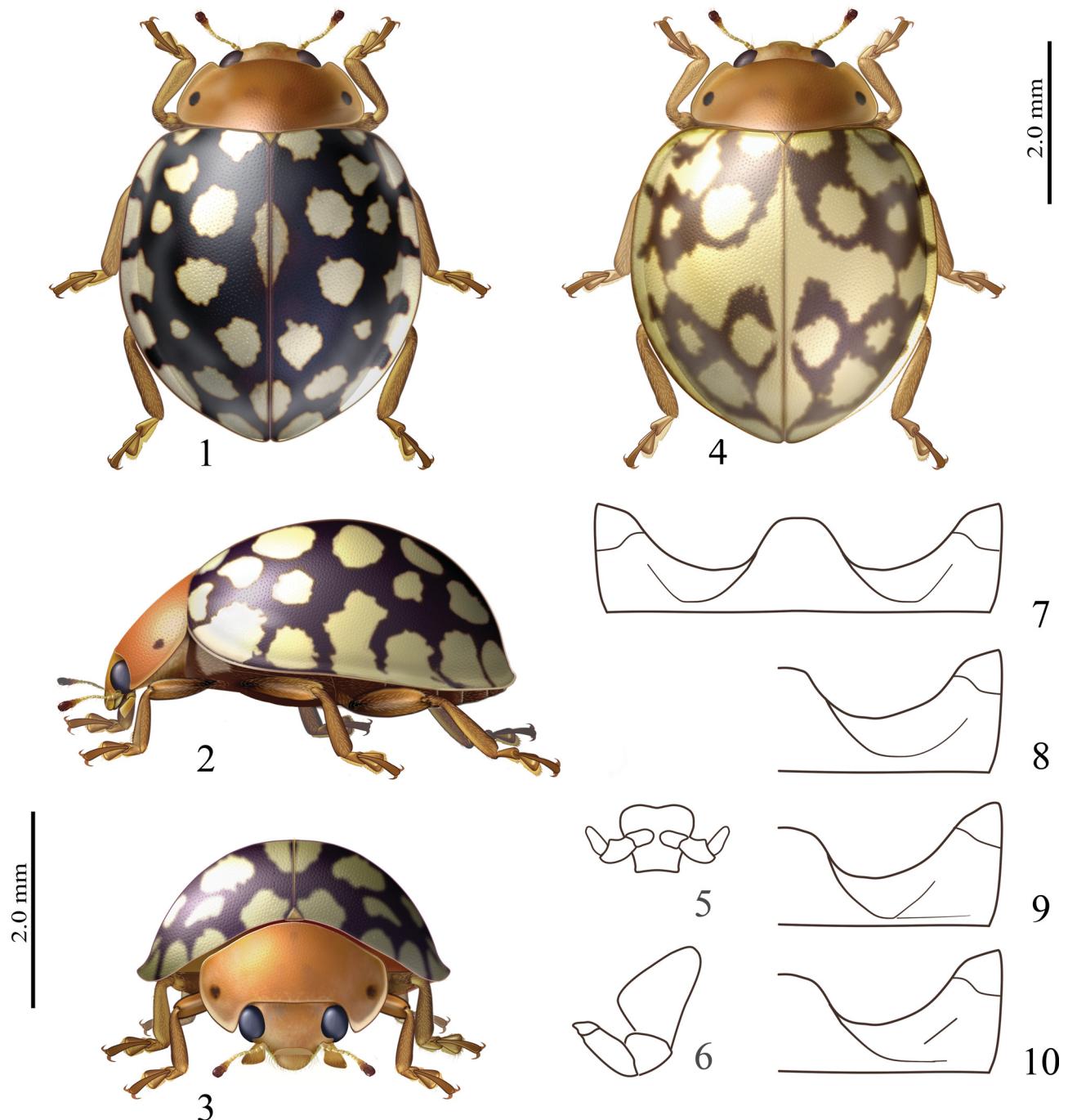
Tribe Coccinellini Latreille, 1807

Neda-group (*sens. Vandenberg 1992, Vandenberg & Gordon 1996, Vandenberg 2002*; composed of *Neda*, *Mononeda*, *Neoharmonia*, the new genus described below, and various species misclassified in *Cyclonedaa* Crotch, 1871)

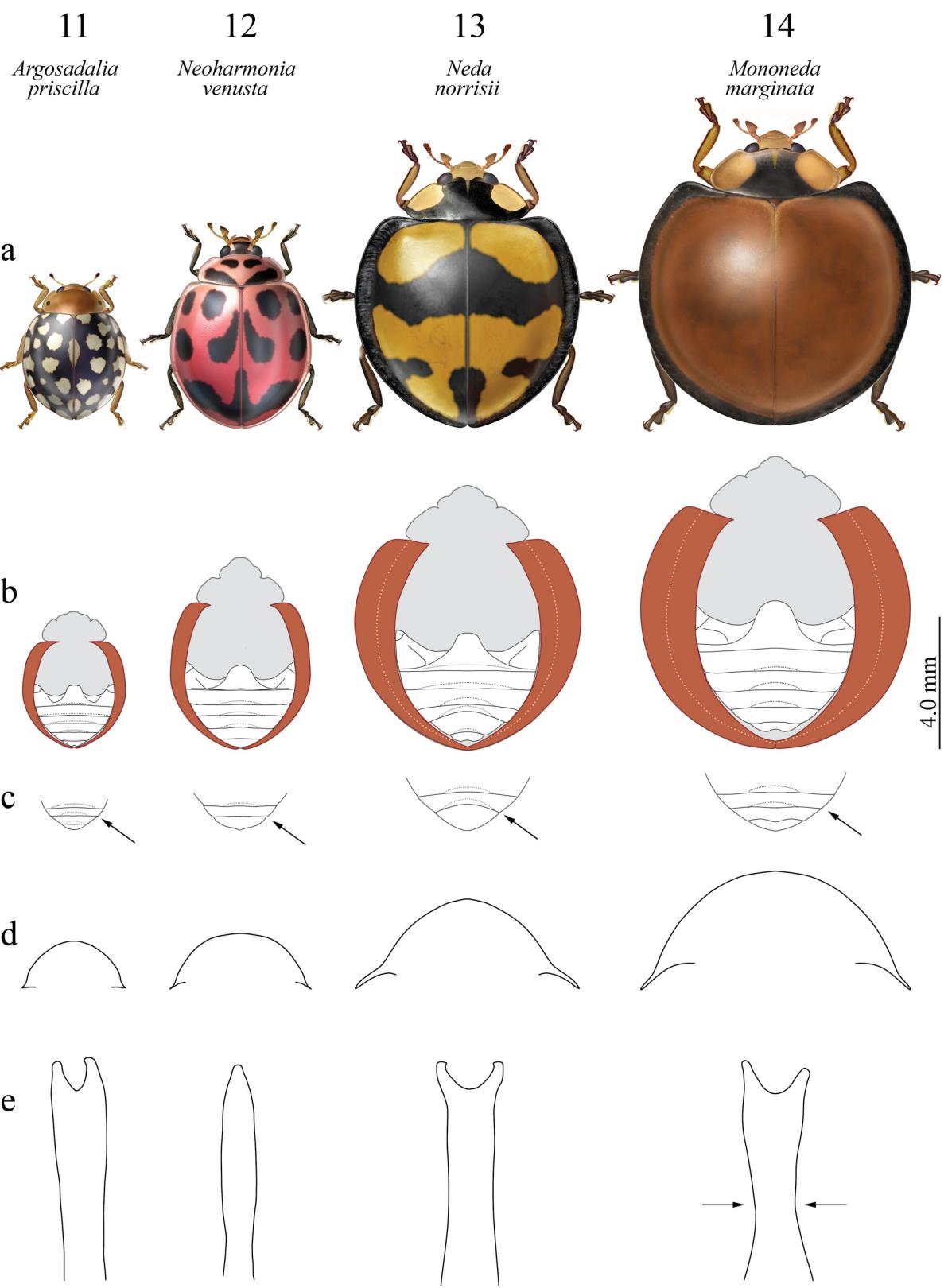
(Figs. 1–4, 11–19)

Diagnosis. Medium-sized to large Coccinellini (3.5–12.4 mm) with cardiod, circular, slightly elongate oval, or escutcheonal (sub-triangular, heater-shaped) body form; elytral margins narrowly to broadly explanate; and meso-, metafemora not or only slightly projecting beyond elytral margin in dorsal view (Figs. 1–4, 11a,d–14a,d). Male genitalia with apex of basal lobe (=penis guide *sens. Ślipiński*) bifid or acuminate (Figs. 11e–14e, 16); penis (Fig. 15) with outer arm of basal capsule elongate conical or apically flared, resembling bell of trumpet and forming

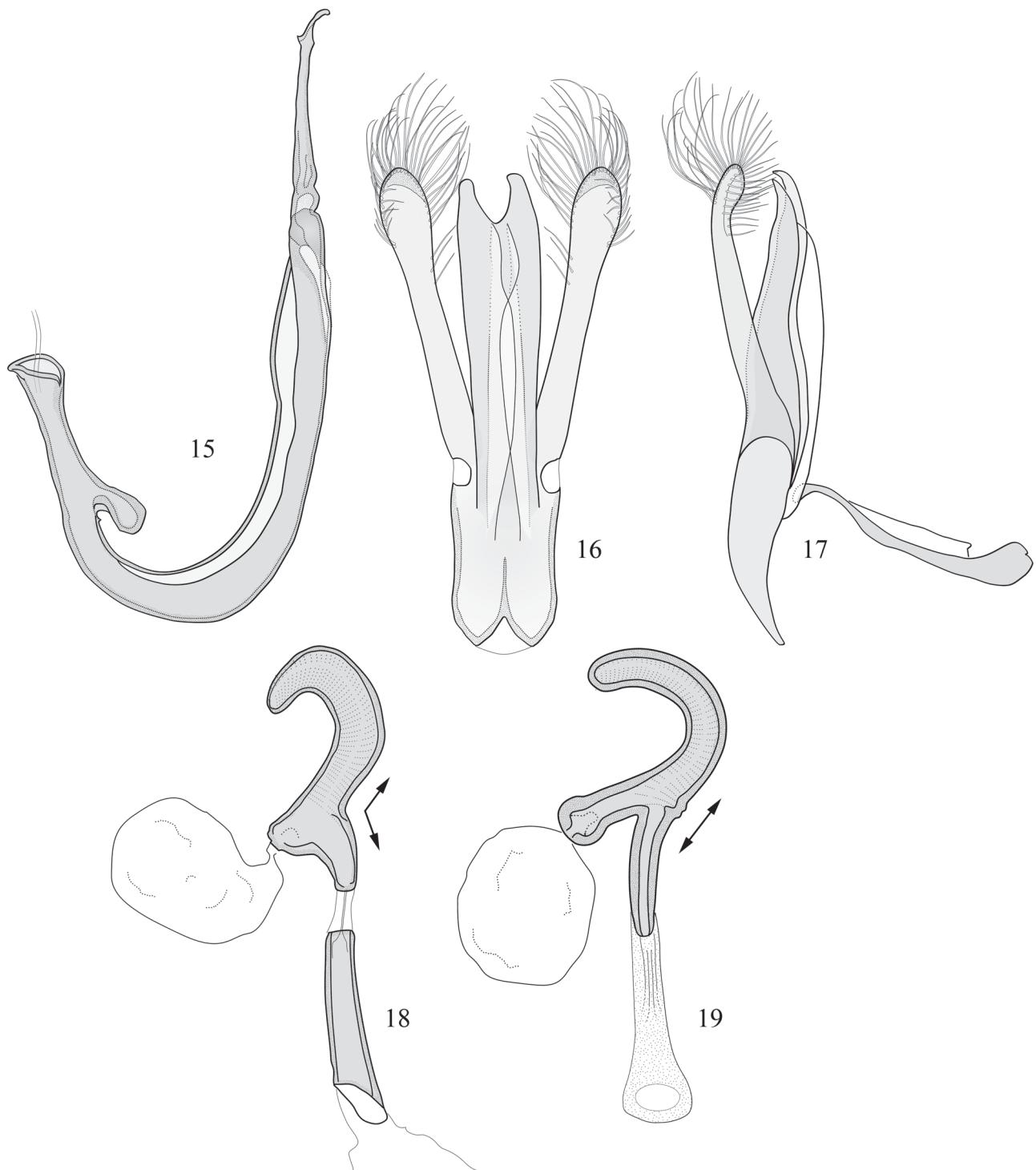
conduit for ejaculatory duct; inner arm of basal capsule (apodeme) short, weakly arcuate; subapical region of penis with twisted or threaded appearance; apex of penis lacking expanded membranous area bearing chitinous struts or spicules. Female genitalia (Figs. 18–19) with sperm duct attached to dorsal end of bursa, enclosed in straight or sinuous tubular sheath (=infundibulum auctorum) for at least part of length; sheath rigid or with reduced flexibility. Spermatheca large, with curved cornu; nodulus typically well developed, but reduced in some; accessory gland large, half length of spermatheca or more; bursa membranous, lacking expanded sclerotized plate or reinforcing struts.



FIGURES 1–10. External morphology of lady beetles in the tribe Coccinellini. **1–4,** *Argosadalia priscilla* sp. nov. habitus illustrations: **1–3**, holotype, male (scale bar lower left): **1**, dorsal; **2**, lateral; **3**, frontal; **4**, paratype, female (scale bar upper right), dorsal. **5–6,** *A. priscilla* sp. nov., ventral view of mouthparts: **5**, labial prementum and palpi; **6**, maxillary palp. **7–10**, abdominal postcoxal lines: **7**, *A. priscilla* sp. nov.; **8**, *Adalia bipunctata* L., 1758; **9**, *Neoharmonia venusta* (Melsheimer, 1847); **10**, *Coccinella* sp.



FIGURES 11–14. Genera of the *Neda*-group, key characters drawn from exemplars of the type species of each genus: **a**, body form in dorsal view, males; **b**, diagrammatic view of venter, males, elytral epipleuron shown in red, abdominal ventrites in white; **c**, apex of abdomen, female, arrow points to hind margin of 4th ventrite; **d**, shape of elytra in cross-sectional view through widest part; **e**, basal lobe of male genitalia in ventral view rescaled to the same length for comparative purposes. Scale bar applies to figures in rows a–d. **11**, *Argosadalia priscilla* sp. nov.; **12**, *Neoharmonia venusta* Melsheimer, 1847; **13**, *Neda norrisii* (Guérin-Méneville, 1844); **14**, *Mononeda marginata* (L., 1767).



FIGURES 15–19. Genitalia of lady beetles in the *Neda*-group. **15–17**, male genitalia of *Argosadalia priscilla* sp. nov.: **15**, left lateral view of penis; **16**, ventral view of phallobase; **17**, right lateral view of phallobase. **18–19**, Female genitalia in dorsal view, arrows to the right of each figure show the outer angle where the cornu joins the nodulus: **18**, *A. priscilla* sp. nov.; **19**, *Neoharmonia venusta* Melsheimer, 1847.

***Argosadalia* gen. nov.**

(Figs. 1–7, 11a–e, 15–18)

type species: *Argosadalia priscilla* sp. nov.

Diagnosis. Distinguished from other members of the *Neda* group by a combination of: body oval, small-sized, with length 5.2 mm or less, elytral margins narrowly but distinctly explanate, with marginal bead (Figs. 1–4, 11a, d). Prosternal intercoxal process lacking carinae. Elytral epipleuron (Fig 11b, d) narrow, with maximum width about 1/7 width of body, subhorizontal in anterior half, planar to weakly concave. Hind margin of abdominal ventrites 1–4 (inclusive of flexure bands) sublinear when abdomen is held flat (Figs. 11b, c); postcoxal line of first abdominal ventrite joined to oblique line and obliterated beyond, forming modified V shape (Fig. 7, 11b). Basal lobe of male genitalia widest before apex, apically bifurcate, terminating in pair of parallel tapered projections separated by U-shaped emargination (Fig. 11e, 16). Spermatheca of female genitalia (Fig. 18) with nodulus joined to cornu to form distinct outer angle, shaped like the number “2,” but with apex of nodulus tapered distally, slightly down-curved at point of attachment to spermiduct.

Remarks. Within the *Neda*-group the new genus resembles some of the smaller members of *Neoharmonia*, but the latter have the prosternal intercoxal process with a pair of convergent carinae separated by a triangular depression, abdominal postcoxal line continued laterally beyond the juncture with the oblique line (Fig. 9), basal lobe of male genitalia with the apex undivided (Fig. 12e), and female spermatheca with a long straight tapered nodulus that flows directly from the cornu without a distinct outer angle (Fig. 19).

The genus *Neda* has the same form of the female spermathecal capsule as the new genus and is probably closely related. However, it can be easily distinguished (Figs. 13a–e) by the larger body size (5.2–10.0 mm in length), broadly explanate elytral margin, epipleuron strongly concave and steeply descending externally, from about 1/4–1/3 body width at widest part, hind margin of abdominal ventrite 4 distinctly arcuately emarginate in both sexes, and the basal lobe of the male genitalia widened apically, with projections diverging distally. *Mononeda* (Figs. 14a–e) also falls within the “*Neda*-group” and differs from the new genus by the much larger body size (length 7.5–12.4 mm), complete lack of an elytral marginal bead, elytral margin broadly explanate, and elytral epipleuron very wide, concave and descending externally, from about 1/3–1/2 body width at widest part, with ventral epipleural carina complete to apex.

The new genus superficially resembles the Holarctic genus *Adalia* in its relatively small size, general body shape, and similar form of the abdominal postcoxal line (Figs. 7, 8), but *Adalia* males have an undivided basal lobe, and a differently shaped penis with a strongly pigmented penis capsule. *Adalia* females have a smaller spermathecal accessory gland and the spermiduct with a more robust and heavily sclerotized sheath.

Etymology. *Argosadalia* (gender feminine) formed from a combination of Argos (= shining, bright, from Greek) + Adalia (= noble, from Hebrew). In Greek mythology, Argos was the name of the hundred-eyed servant of the goddess Hera, who had eyes all over his body. This name was selected because of the numerous white spots on the elytra which resemble eyes. The second part of the name was used because of the superficial similarity of this lady beetle to members of the lady beetle genus *Adalia*.

Argosadalia priscilla sp. nov

(Figs. 1–7, 11a–e, 15–18, 20)

Diagnosis. The distinctive dorsal color pattern of this new species (Figs. 1–4) will easily distinguish it from other known species of New World lady beetles. Also, as the single member of the genus *Argosadalia*, it can be distinguished from its closest known relatives using the characters discussed in the generic “Diagnosis” and “Remarks,” above, and accompanying illustrations (Figs. 11–14). If additional species of this genus come to light, the exact form of the male genitalia will probably serve as the best means of separating them.

Description of holotype (male). Length 4.1 mm, width 3.1 mm. Form slightly elongate, oval, slightly pointed apically, widest at middle of elytral length (Fig. 1), moderately convex (elytral height/elytral length=.50) (Fig. 2), with elytral margin narrowly but distinctly explanate (Fig. 3). Dorsal surfaces shagreened, most noticeably on head. Punctuation on elytron moderate, separated by about 1.0–1.5 diameters, on head and pronotum finer, less regularly distributed, separated by 0.5–3.0 diameters. Ground color of head and pronotum orange; head without distinct maculae; pronotum with small oval dark brown spot centered in each lateral 1/5; median 3/5 with vague, almost indiscernible dappling. Conjoined elytra with 32 cream colored spots on deep maroon, nearly black background; spots arranged on each elytron as follows: 2 well separated subtriangular spots touching elytral base, larger spot contiguous with scutellum, smaller spot in front of humeral bulge; 2 oval common sutural spots, anterior somewhat

suffused by background color, placed just in front of basal half, posterior spot subapical; remaining spots forming 3 longitudinal arcuate series, with first series parasutural, composed of 3 large roughly circular discal spots of approximately equal diameter, bracketing anterior common sutural spot; second series paralateral composed of 4 smaller spots, anterior most crescentiform, placed just below humeral bulge, 2 subcircular centered at basal 1/3 and basal 3/5, 1 oblique subapical; third series lateral, composed of 6 irregular polygonal spots evenly spaced along elytral margin from humeral angle to just before apical angle, posterior 4 narrowly connected just inside raised lateral bead. Ventral surfaces including mouthparts, antenna, legs predominantly light yellow brown; darker reddish brown on abdominal ventrites 1–3, lateral part of 4, antennal club, distal end of terminal maxillary palpomere, metafemur and all femoral apices, external edge of tibiae, distal tarsomeres, mesepisternum, metepisternum, and lateral fourth of metaventrite. Mesepimeron, metepimeron, elytral epipleuron cream colored. Head (Fig. 3) transverse; eyes finely faceted separated by about 2× diameter in frontal view, weakly emarginated by digitiform canthus; clypeus with anterolateral angle produced; labrum subtrapezoidal, wider at base, with apical corners rounded; antenna with 11 antennomeres, club gradual, with last antennomere longer than wide, suboval with somewhat oblique apex. Labium with prementum subtrapezoidal, weakly bilobed apically (Fig. 5). Maxilla with terminal maxillary palpomere slightly elongate triangular with rounded corners (Fig. 6). Pronotal base lacking marginal bead. Scutellar shield triangular with posterior angle narrowly attenuate. Prosternum T-shaped with lateral arms weakly folded back, intercoxal process weakly convex, lacking carinae, with faint raised lateral bead. Mesoventrite with anterior margin roundly, weakly emarginate at middle; anterior face with triangular depression to receive intercoxal process. Elytron with lateral bead, but less distinct toward apex. Elytral epipleuron complete to apex, subhorizontal except slanted externally in apical 1/6, flat to weakly concave, widest anteriorly, tapered from near base of abdomen to apex, with greatest width equal to about 1/7 maximum body width (Fig. 11b, d); ventral epipleural carina (part of abdominal locking mechanism) not continued to elytral apex. Abdomen (Fig. 11b) with 6 ventrites; hind margin of ventrites 1–5 inclusive of flexure bands linear when abdomen held flat, of ventrite 6 rounded with superficial medial notch; ventrite 1 moderately long with distance from coxal cavity to apex subequal to length of coxa; abdominal postcoxal line (Fig. 7) reaching 4/5 distance from coxal cavity to apex of first ventrite, subangularly joined to oblique line and entirely obliterated beyond, forming modified V-shaped figure with outer part short, linear, not attaining basal or lateral margins of ventrite, inner part weakly arcuate. Male genitalia (Figs. 15–17) with basal lobe about as long as paramere, widest just before apex, apically bifurcate, terminating in pair of tapered upcurved projections separated by U-shaped emargination, with left projection (appearing on right-hand side of ventral drawing (Fig. 16), or lower plane of lateral drawing (Fig. 17)) slightly longer, more curved than right; paramere spoonshaped, with long setae on perimeter and outer surface of apex; corresponding inner surface concave with oblique subapical ridge marking beginning of concave area; basal piece distinctly longer than wide, with distal end appearing weakly bilobed but actually connected by thin membrane. Penis with apex forming elongate tapered spout-like structure bearing median orifice, preceded by short preapical twisted or threaded region.

Female. Similar to male except larger on average, proportionally slightly broader than male (Fig. 4) with elytral apex slightly more pointed. 6th abdominal ventrite evenly arcuate (Fig. 11c). Female genitalia (Fig. 18) with most of sperm duct bearing sclerotized sheath, tapered toward spermatheca, obliquely truncated at bursal end.

Variation. Length 3.5–5.2 mm. Ground color of head and pronotum reddish orange to straw yellow. Head immaculate or with pair of discrete or confluent dark brown basal spots. Pronotum variable: immaculate, or with pair of dark brown discal spots more or less distinct than in holotype, or with 4 dark brown discal spots forming transverse series; specimens from Puyo with median 3/5 of pronotum infuscate, in some specimens forming blurry M-shaped mark. Elytral ground color darker or lighter; pale spots vary from off-white to yellow, larger or smaller than in holotype; elytral spot below humeral bulge crescentiform to nearly circular; other spots also show slight variations in shape, with confluence of adjacent spots common in specimens with larger markings; some specimens with sutural, parasutural markings coalesced to form large common central mark, evoking a fleur-de-lis shape (Fig. 4). Elytral epipleuron immaculate or with faint dark spots wrapped around from dorsal surface.

Etymology. Priscilla, proper noun in apposition, named in honor of my mother Priscilla Campbell Vandenberg (1925–2018). Mom held progressive views on child-rearing, and supported my early interests in entomology despite a general climate of the times that disapproved of young girls following such pursuits. She learned the scientific names of all the common lady beetle species in her garden and always brought a jar with her when she went golfing so she could bring me any unusual lady beetles she might encounter.

Type material. Holotype (male) with labels: “Bolivia — 360m alt., Dept. Cochabamba, San Antonio Rd., VIII,

5, 1951, in tree, G.H. Dieke / Slide 541203 ♂ / Adalia cardenasi Dieke paratype [unpublished manuscript name, label folded in half to indicate a non-valid name] / G.H. Dieke, coll'n 1965 / Holotype, *Argosadalia priscilla* Vandenberg 2019" with associated slide mounted genitalia with labels "541203, Adalia cardenasi Dke, paratype, ♂ genitalia, Bolivia S. Anton [unpublished manuscript name, label marked with oblique pencil slash] / Holotype, *Argosadalia priscilla* Vandenberg 2019" (USNM); 22 paratypes: 5 (all females) with same first, third and fourth labels as holotype, and last label "Paratype, *Argosadalia priscilla* Vandenberg 2019" (USNM); 7 (6 males, 1 female; 1 male with head and thorax missing) with same last label as preceding, and additional labels "BOLIVIA, COCHA-BAMBA-Chapare, Villa Tunari, 500m-5-9-I-1958, Monros -Wygodzinsky / COLECCION, INST.-FUND. M. LILO, (4000)-S.M.TUCUMAN, TUCUMAN-ARGENTINA" (IFML); 1 (female) with labels "Bolivie, Ocobamba, Garlepp / PM" (PM); 6 (sexes not determined) with same last label as preceding, and additional labels "ECUADOR: Puyo, 900-960m, 1-8.X.1970 / J & M. Sedlacek Collectors, BISHOP" (BPBM); 3 (sexes not determined) with same last label as preceding, and additional labels "ECUADOR: Puyo, 960m, 1-8.X.1970 / J & M. Sedlacek Collectors, Bishop Museum" (BPBM).

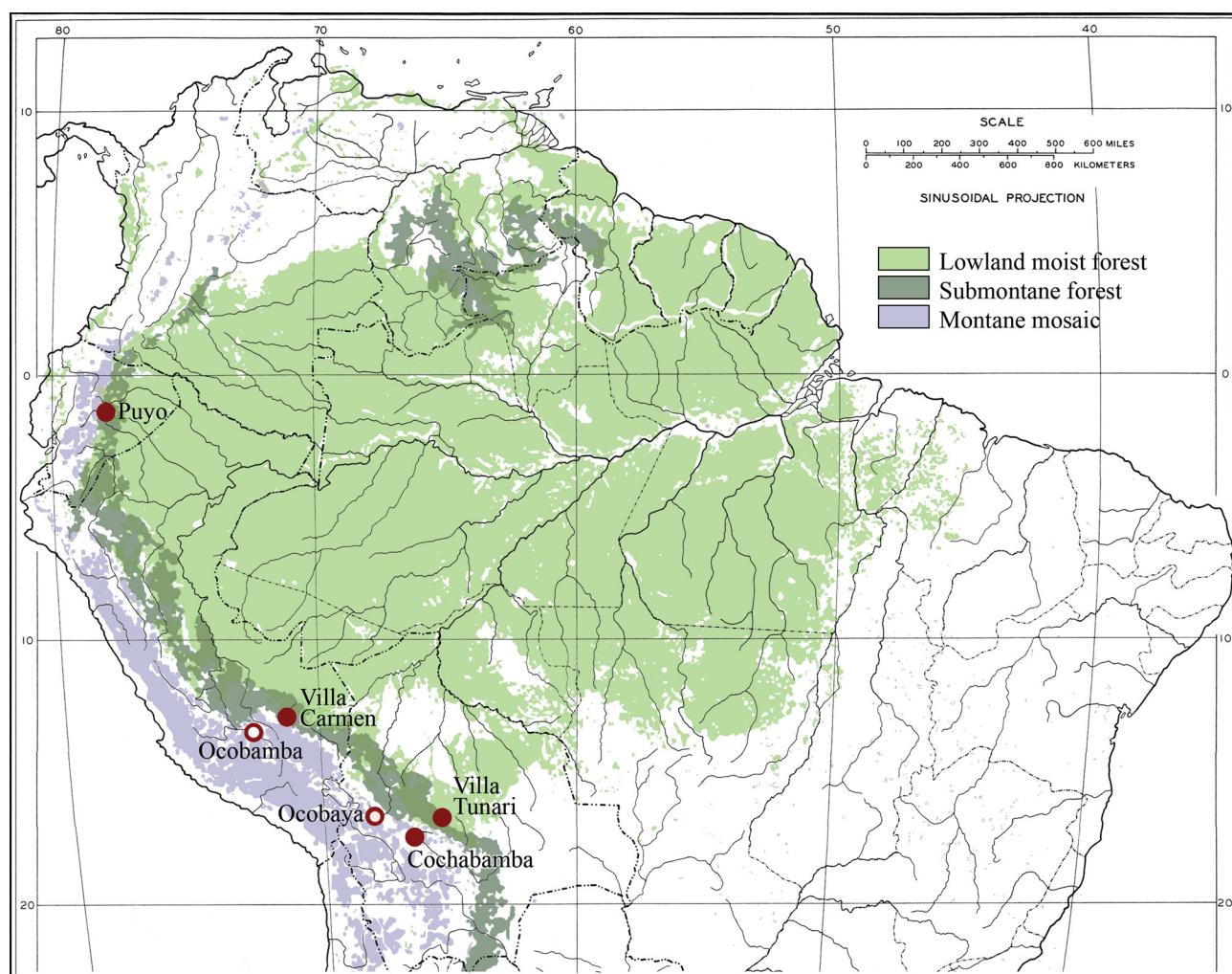


FIGURE 20. Known distribution of *Argosadalia priscilla* sp. nov. plotted on a vegetation map of tropical South America (after Eva *et al.* 1999). Data points are represented in red dots. The hollow dots show the two conflicting interpretations of the locality of a specimen collected by Garlepp: Ocobamba, Peru vs. Ocobaya, Bolivia (see "Remarks," below, for further information).

Additional material. Digital images encountered on the World Wide Web also appear to belong to this species: 4 images of a specimen photographed by J. McClarin (2015) on 2015-II-17 with associated data "Small lady beetle (family Coccinellidae) found near the Rio Bobonaza near Puyo, Pastaza, Ecuador, 600+ meters elevation. 2015-II-17"; habitus views, female genitalia, and morphological details of a specimen with associated data "Perú, Cusco, Villa Carmen, Field Station near confluence of Pilcopata & Pini-Pini rivers. [...], 505m, 25-V-2011 DJ Bennet" (KSBS) (González 2015).

Distribution (Fig. 20). The known distribution of the new species is summarized, below, with climatic and vegetation information, gleaned from the literature and internet sources, placed in square brackets:

BOLIVIA: *Cochabamba*: Chapari, Villa Tunari (500 m) [tropical rainforest (Abrahamczyk *et al.* 2010)]; “San Antonio Rd.” (360 m) [data for Cochabamba, Cochabamba: semi-arid with moderate Spring-like temperatures year round (Wikipedia contributors 2019b)]; *La Paz*: ?Ocobaya (see remarks, below)

ECUADOR: *Pastaza*: Puyo (900–960 m); near Puyo (600+ m) [predominantly submontane tropical rainforest (Wikipedia contributors 2019a)].

PERU: *Cusco*: Pilcopata, Villa Carmen Field Station (505 m) [cloud forest to montane and lowland rainforest (Amazon Conservation Association 2019)]; La Convencion, ?Ocobamba (see remarks, below).

Remarks: The collection locality “Ocobamba, Bolivia” of the single paratype collected by “Garlepp” was not found on any maps of Bolivia. Gordon (1975) described another lady beetle species, *Mada pseudodamata* Gordon, 1975, with the same collection labels, and suggested that the specimen was probably from “Ocobayba” (sic, probably a misspelling or alternative spelling of Ocobaya) in the Department of La Paz, Bolivia. Another possibility is that both of these specimens came from Ocobamba, Department of Cusco, Peru. The Garlepp brothers, Otto and Gustav were naturalists and avid collectors of neotropical birds, insects, and small mammals (Wikipedia contributors 2019c). According to Hershkovitz (1944), Otto Garlepp collected water rats in the Ocobamba Valley, Peru in 1897, so it is at least possible that he also did some beetle collecting at that time. I have included both alternative localities for the Garlepp specimen in the distribution above preceded by a question mark.

Another locality that could not be found for certainty was San Antonio Rd, Dept. Cochabamba, Bolivia. I did find a Plaza San Antonio opposite San Antonio Church in Tarata, Cochabamba, Bolivia with a couple dozen large trees and foot paths, so it is possible that this is the collection locality. The town Tarata is contiguous to the town of Cochabamba, both in the Department Cochabamba.

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